

**CELL STRUCTURE AND FUNCTION**  
**On-Level 7<sup>th</sup> Grade Science**  
**2011-2012**

**Description**

All living organisms are made of cells. A cell is the smallest unit able to perform life functions. All cells come from pre-existing cells through processes of cell division. When cells divide, the hereditary information they contain, DNA, is passed from cell to cell. All cells, plant and animal, have basically the same composition, and carry out many of the same chemical reactions. Energy flow occurs within cells allowing life processes to be carried out. Living organisms contain specialized molecules such as carbohydrates, lipids, proteins, and nucleic acids. These molecules join together to form structures within the cell called organelles, each of which is responsible for cellular functions. Important organelles include cell membrane, cell wall, nucleus, cytoplasm, mitochondrion, chloroplast, and vacuole. Each cell consists of a discrete body of jelly-like cytoplasm surrounded by a cell membrane. The organelles are suspended within the cytoplasm. In most multi-cellular organisms, cells associate to form tissues, tissues are arranged into functional structures called organs, coordinated groups of tissues and organs carry out major biological functions and are called organ systems, and organ systems make up the complex multi-cellular organism. Cellular processes can affect the behavior of an organism, such a plant wilting from low turgor pressure, and behavioral changes in both plants and animals resulting from hormonal changes. Emphasis is placed on differentiation between structure and function of organelles in plant and animal cells, on comparing and contrasting functions of the cell (such as digestion and waste disposal) with functions of the organism, and on conversion of food to energy, both at the cellular level and in the organism.

**Connections**

Cells are the smallest units of life. Many functions that occur inside the cell are similar to functions of larger systems within an organism. In addition, energy transfer as well as physical and chemical changes occur in the living cell as well as in non-living structures. Energy transfer is discussed for nonliving structures in a previous unit. Physical and chemical changes, including the breakdown of larger particles into smaller particles during digestion, will be examined in relation to human body systems in a later unit. Cells are specialized, and may differ in their processes depending on their specific function in the same way that physicians or teachers specialize in a specific area.

**Enduring Understandings**

1. Cells are the smallest unit that can carry out life processes, and only come from other cells.
2. Cells are part of the hierarchical organization of living organisms: cells make up tissues, tissues make up organs; tissues and organs make up organ systems, and organ systems make up organisms.
3. Plant and animal cells have similar structures necessary to carry out cellular functions, including cell membrane, nucleus, cytoplasm, mitochondrion, and vacuole.
4. Although plant and animal cells have many of the same structures, they have unique differences. Plant cells contain cell walls and chloroplasts which animal cells do not have, and animal cells contain lysosomes and centrioles which plant cells do not contain.
5. Cellular organelles carry out specific functions for the cell, much like organs carry out specific functions for the organism.
6. Cellular activity transforms energy needed for life processes.
7. The correct disposal of waste is essential for daily life; this also applies at the cellular level.
8. Internal cellular processes are sometimes externally visible. For example, when a plant does not have enough water in its vacuoles, turgor pressure drops and the plant wilts, and when plant hormones accumulate, tropisms occur.

### **Essential Questions**

1. How did cell theory develop and who were the major contributors?
2. What are the components of modern cell theory?
3. Beginning with the cell, how are living things organized?
4. What are the internal structures of plant and animal cells, and how are they different?
5. What are the functions of cell organelles?
6. How is energy transferred during cellular processes?
7. How do internal cellular processes show externally?
8. How is cellular waste disposal similar to waste disposal of an entire organism?

### **Essential Concepts and Skills**

By the end of the unit, the student is expected to:

1. critique early cell theory and explain how it has been improved upon over time
2. generate a flow chart showing life organization, beginning with the cell
3. diagram and describe the function of internal cellular structures, including cell membrane, cell wall, nucleus, cytoplasm, mitochondrion, chloroplast, and vacuole
4. compare and contrast components of cell for different types of organisms, including plants and animals
5. compare and contrast how energy is transferred during cellular processes for different organisms
6. explain the effects of cellular processes on varying turgor pressure and accumulation of hormones in a plant
7. portray how cellular functions are similar to functions of the larger organism such as waste disposal

### **What do students typically have as misconceptions?**

1. Cells are the components of many things including carbohydrates and proteins
2. Living things grow because their cells get larger.
3. There are only two kinds of cells - plant and animal.
4. All cells have nuclei.
5. Cells are inside the human body, rather than the human body is itself composed of cells.

### **Preconception Survey**

1. How do living things grow?
2. What do all cells have in common?
3. How are cells related to the human body?

### **Formative Assessment Items**

1. Use a microscope to identify different types of cells and their functions
2. Make a flow chart to show the organization of living things from cell to organism
3. Sketch a picture of a common cell and its organelles and describe what each organelle does
4. Create a Venn Diagram to compare and contrast organelles found in plant and animal cells
5. Outline the similarities between digestion and waste removal in the cell and in the larger organism

### **TEKS Covered**

**7.7 Force, motion, and energy.** The student knows that there is a relationship among force, motion, and energy. The student is expected to:

B) illustrate the transformation of energy within an organism such as the transfer from chemical energy to heat and thermal energy in digestion.

C) demonstrate and illustrate forces that affect motion in everyday life such as emergence of seedlings, turgor pressure, and geotropism.

**7.12 Organisms and environments.** The student knows that living systems at all levels of organization demonstrate the complementary nature of structure and function. The student is expected to:

C) recognize levels of organization in plants and animals, including cells, tissues, organs, organ systems, and organisms.

D) differentiate between structure and function in plant and animal cell organelles, including cell membrane, cell wall, nucleus, cytoplasm, mitochondrion, chloroplast, and vacuole. ***Supporting Standard-Category 4***

E) compare the functions of a cell to the functions of organisms such as waste removal.

F) recognize that according to cell theory all organisms are composed of cells and cells carry on similar functions such as extracting energy from food to sustain life. ***Supporting Standard-Category 4***

**6.12 Organisms and environments.** The student knows that all organisms are classified into Domains and Kingdoms. Organisms within these taxonomic groups share similar characteristics which allow them to interact with the living and nonliving parts of their ecosystem. The student is expected to:

D) identify the basic characteristics of organisms, including prokaryotic or eukaryotic, unicellular or multicellular, autotrophic or heterotrophic, and mode of reproduction, that further classify them in the currently recognized Kingdoms. ***Supporting Standard-Category 4***

### **Vocabulary**

DNA, hereditary, carbohydrates, lipids, proteins, nucleic acids organelles, cell, tissue organ, organ system, organism, cell membrane, cell wall, nucleus, cytoplasm, mitochondrion, chloroplast, vacuole, cytoplasm, lysosomes, centrioles, turgor pressure, hormone, tropisms